With regard to the question of astronomical refraction, the evidence afforded by this investigation, as far as it goes, seems to confirm the results deduced from the discussion of the N.P.D.'s of the Cape 1860 and Melbourne 1870 Catalogues—viz., that down to about 80° Z.D. the Greenwich observations are satisfactorily represented by the refractions of the *Tabulæ Regiomontanæ*, and that below that limit some such corrections as those proposed by Mr. Main are required. Thus, in the table above, the correction at 84° Z.D. is about $-1''$, and that at $86\frac{3}{4}°$ is about $-2''\cdot5$, and the discordances are then reduced to $+\cdot56$ and $+\cdot31$ respectively. At the same time it will be remarked that the Cape observations near the north horizon appear to require refractions diminished in a larger proportion, and corrections commencing at a less zenith distance than is the case at Greenwich. On this point, however, further investigation is desirable, the materials for which are now, we may hope, rapidly accumulating.

The comparison of N.P.D.'s of principal "Nautical Almanac" stars in the Greenwich and Cape Catalogues for 1840, given in the Introduction to the latter, has been utilised, for the stars situated between N.P.D. 60° and 118°, for the purpose of ascertaining whether there is any outstanding correction depending on the meteorological elements. For this purpose these stars have been combined in groups extending over six hours of R.A., with the result :—

R.A.	0^h–6^h	6^h–12^h	12^h–18^h	18^h–24^h
Greenwich – Cape	$-''\cdot02$	$+''\cdot08$	$+''\cdot53$	$+''\cdot22$.

If $+''\cdot10$ be taken as the systematic difference between the Catalogues for the limits of N.P.D. under consideration, we have—

R.A.	0^h–6^h	6^h–12^h	12^h–18^h	18^h–24^h
Greenwich – Cape	$-''\cdot12$	$-''\cdot02$	$+''\cdot43$	$+''\cdot12$.

The similarity of this result to that given by Mr. Stone as deduced from his own observations (*M. N.* vol. xl. p. 70) is very striking, and remarking the large relative discordance in the third group—that is, for observations made during May, June and July—tends to confirm his opinion that the complete reversion of the seasons at the northern and southern Observatories is not quite accurately allowed for in the refraction tables.

On the Apparent Conjunctions of the Satellites of Uranus with each other, 1881. By A. Marth, Esq.

When the apparent orbits of the satellites are flat ellipses, as they are at present, the satellites will not rarely pass one another at a short distance. Usually they will come to conjunction by encountering one another while moving in opposite directions

on different sides of the great axes of their orbits, but sometimes they will overtake one another while moving in the same direction. When two satellites are at or near conjunction, measurements of their position-angles in reference to the planet's centre cannot well be made with confidence, as the observer's judgment will not be unaffected, but the observation of their conjunction in distance, or the fixing of the time when they are at exactly the same distance from the planet, can be made with nicety, even without micrometer, and such observations will furnish very valuable tests for the theories of the satellites. I have therefore considered it worth while to make the present addition to the Ephemeris published on pages 67–72. During the interval of time over which the Ephemeris extends, some 160 conjunctions of satellites occur, the circumstances of which had to be examined. As I have not yet learnt how close to the planet the satellites can be seen in some of the most powerful telescopes, the limit of about 10″, which I have adopted, may perhaps be too exclusive. Disregarding all those conjunctions which take place within this limit of distance from the planet's centre, and those which on account of daylight and other hindrances offer no fair prospect of being observable in Europe or America, I give for the rest, in the following list, the position-angles and distances of the satellites for the nearest preceding and following even hour G.M.T., so that the circumstances of each conjunction may be seen at a glance:—

			Ariel.		*Umbriel.*		*Titania.*		*Oberon.*	
	1881.	G.M.T. h	Pos. °	Dist. ″	Pos. °	Dist. ″	Pos. °	Dist. ′	Pos. °	Dist. ″
Febr.	18	8	—		200·1	11·4	187·8	16·0	—	
		10	—		198·8	13·6	186·6	14·2	—	
		12	—		197·9	15·5	185·2	12·3	—	
	20	12	—		19·9	13·9	—		6·7	19·4
		14	—		17·9	15·8	—		5·8	17·8
		16	—		17·1	17·4	—		4·7	16·1
	27	10	197·1	12·8	—		—		183·6	15·8
		12	196·0	14·2	—		—		182·1	14·1
		14	195·2	15·1	—		—		180·2	12·4
March	3	8	15·5	14·9	—		7·5	17·7	—	
		10	14·6	15·3	—		6·4	15·8	—	
		12	13·8	15·1	—		4·8	13·7	—	
	4	16·0	194·7	15·3	—		203·1	15·2	—	
		16·6	194·5	15·3	—		202·7	15·7	—	
	7	10	192·2	13·3	195·5	20·7	189·6	22·9	210·6	12·1
		12	190·7	11·5	195·0	21·2	188·9	21·3	208·4	13·8
		14	188·8	9·2	194·4	21·3	188·2	19·6	206·7	15·5
		16	—		193·9	21·1	187·3	17·9	205·4	17·1

		G.M.T.	*Ariel.* Pos.	*Ariel.* Dist.	*Umbriel.* Pos.	*Umbriel.* Dist.	*Titania.* Pos.	*Titania.* Dist.	*Oberon.* Pos.	*Oberon.* Dist.
	1881.	h	°	″	°	″	°	″	°	″
March		18	—		193·3	20·6	186·2	16·1	204·2	18·8
		20	—		192·7	19·7	184·8	14·2	203·3	20·4
	18	18	—		—		16·3	32·3	10·2	34·8
		20	—		—		16·0	33·0	9·7	33·3
	26	8	11·2	13·0	—		27·4	12·9	—	
		10	9·7	11·2	—		25·4	14·8	—	
		12	—		12·0	19·3	23·9	16·6	—	
		14	—		11·2	18·0	22·7	18·4	—	
	27	14	191·5	13·2	203·8	10·1	—		—	
		16	189·9	11·4	201·5	12·3	—		—	
		18	187·5	9·1	199·8	14·4	—		—	
	28	14	—		—		12·0	31·7	20·4	30·2
		16	—		—		11·7	30·8	19·9	31·5
April	2	8	20·4	10·0	—		—		352·1	11·0
		10	18·3	11·6	—		—		347·9	9·4
	7	8	22·0	8·8	—		1·4	13.6	—	
		10	19·4	11·1	—		359·0	11·8	—	
		12	17·6	13·0	—		355·6	9·9	—	
	8	14	—		—		204·1	17·0	183·0	20·4
		16	—		—		202·8	18·8	181·8	18·8
	14	10	—		—		14·2	34·4	9·5	35·2
		12	—		—		13·9	34·3	9·1	34·0
	15	10	—		17·3	14·5	9·2	25·8	1·1	18·4
		12	—		16·6	16·3	8·6	24·4	359·6	16·8
		14	—		16·1	17·8	7·9	22·9	357·8	15·2
		16	—		15·6	19·1	7·1	21·4	355·5	13·6
		18	—		15·2	20·0	6·1	19·7	352·7	12·0
	18	16	202·8	8·4	185·8	11·8	—		—	
		18	199·9	10·8	182·9	9·6	—		—	

On January 23 and 24 *Ariel* and *Titania*, moving in the same direction, will remain near one another; on January 27 and 28, *Umbriel* and *Titania*; on March 3 and 4, *Ariel* and *Titania*; on April 9, *Ariel* and *Oberon*; on April 25, *Umbriel* and *Titania*; on May 19 and 20, *Ariel* and *Oberon*.

I need not hint that when the two faint satellites or the two brighter satellites are at equal distances from the planet and near each other, the conditions are most favourable for comparing their brightness.

In March next a century will have elapsed since the dis-

covery of *Uranus* by Herschel. What is the present state of the group of stars which Herschel represents on Tab. xxv. p. 500 of vol. lxxi. of the "Philosophical Transactions"? From March 13 to April 19, 1781, Herschel determined the places of *Uranus* by measuring its distances and position-angles in reference to six stars, $\alpha, \beta, \gamma, \delta, \epsilon, \zeta$. Of these stars of comparison, only α and ϵ, so far as I know, have been observed with meridian instruments—α, 1782, February 5 and 7, at Greenwich, and about 1840 by Rümker; and ϵ, by Rümker, in whose catalogue the places of three other stars of Herschel's figure are also found. The approximate positions of these stars for 1855, as given in the "Bonner Durchmusterung," and the more accurate positions for 1881·0, as deduced from Rümker's places for 1836, with the Pulkova precession constants, are the following:—

		1855.				1881.			
		α		δ		α		δ	
	m	h m	s	°	′	h m	s	° ′	″
α	9·0	5 40	30·4	+23	34·0	5 42	6·06	+23 35	6·7
	9·0	40	52·8		38·9				
β	9·4	41	11·9		37·0				
γ	9·5	41	37·2		36·5				
δ wanting.									
η	8·7	41	43·3		25·9	5 43	17·82	23 26	6·2
	9·1	42	20 8		49·6	5 43	55·71	23 50	15·7
θ	8·8	42	26·3		52·8	5 44	0·99	23 53	30 8
ϵ	8·8	44	6·1		34·0	5 45	40·68	+23 34	46·8
ζ	9·4	5 44	17·3	+23	38·7				

Will not observers determine the places of the stars visible between the limits $5^h\ 42^m$ and $5^h\ 46^m$ in Right Ascension, and $23°\ 25'$ and $23°\ 55'$ in Declination, and make a map of the region? Herschel's sketch was made with a 7-inch reflector, so that no more powerful telescope would be required.